

Report of the Sediment Toxicity work group
May 3, 2005

Issue #1 is an item on which discussion and resolution from the entire Technical Issues Committee is desired. Issues #2-4 are for informational purposes only.

ISSUE #1

The major item addressed by the Sediment Toxicity work group up to this point has been the suitability of the growth endpoint as a measure of sediment toxicity in the 10-day Hyaella azteca bulk sediment toxicity test. Standardized protocols call for measuring survival of the animals over a 10-day sediment exposure, as well as their growth. However, there was broad consensus among work group members that:

1. Growth of H. azteca can be inhibited by the presence of toxicants, but it can also be enhanced by the amount and type of organic matter within the sediments.
2. While the YCT (yeast, cerophyll, trout chow) feed provided to the amphipods during the course of the test does promote some growth, natural organic matter within test sediments will often substantially further increase the growth rate. As a result, H. azteca grows much faster in some test sediments than in others, even in the absence of toxicants.
3. There is no standard control sediment used by all testing labs, nor do national toxicity testing protocols provide guidance for selecting one with respect to the growth issue. Thus, labs use control sediments with varying degrees of nutritional value to H. azteca, with the result that growth of H. azteca in controls in some labs is far greater than growth in others.
4. Since "toxicity", using the growth endpoint, is defined as reduced growth relative to controls, it is expected that a sediment that one lab identifies as "toxic" based on reduced growth relative to controls, could be identified as "non-toxic" by another lab if using control sediments in which the animals grow slower.
5. There is no simple way to correct for differences among sediments in their nutritional value because the standard parameter measured (total organic carbon) has not been a good predictor of H. azteca growth in the State's Ag Waiver monitoring to date.

The work group members agreed that mortality was a superior endpoint, far less susceptible to natural differences among sediments independent of toxicant concentrations. With the confounding affects of sediment nutritional value and toxicants on H. azteca growth rates, it is not clear what a reduction in growth in a given sediment would indicate, when not accompanied by mortality. The work group believed that decisions for further monitoring or corrective action should rarely, if ever, be based on growth inhibition alone. Given the limited resources available for monitoring, the work group advises that Hyaella toxicity testing under the Ag Waiver program not include the growth endpoint. Funds could be better allocated, such as by supporting the monitoring of more sites using the mortality endpoint.

ISSUE #2

The work group discussed on which sediment samples it would be appropriate to do chemical analyses. The options available are:

- All sediments (current practice for State-sponsored monitoring under Ag Waiver program.)
- Only those showing elevated mortality in a toxicity test
- Those showing mortality, plus some pre-defined proportion of non-toxic samples in order to obtain comparative data
- No sediment samples (current practice among coalition group sampling)

It was recognized that doing no chemical analyses severely hampers interpretation of toxicity when observed, and provides no guidance to efforts to mitigate that toxicity. However, there are substantial costs associated with doing the chemical analyses. The work group did not address this issue in greater detail and did not attempt to reach consensus. However, there was agreement that sediment grain size distribution and total organic carbon (if chemistry data are available) are important and relatively inexpensive parameters to measure.

ISSUE #3

Until recently there have been few analytical laboratories providing quantification of pyrethroid insecticides, and the few available have been academic or governmental labs. Private sector analytical capabilities for pyrethroid pesticides are just beginning to emerge. Work group members were aware of several commercial laboratories that are now marketing a capability for pyrethroid analyses in either a water or sediment matrix. While the labs themselves have been operating for many years and have produced reliable data for other substances, their pyrethroid capability is difficult to judge given its recent emergence. Pyrethroid insecticides in agricultural environments are recognized to be an important environmental quality issue, and development of a private sector analytical capability should be encouraged. In the short term though, there is a need for interlaboratory comparison, testing of performance standards, and similar quality assurance procedures to insure data reliability.

ISSUE #4

The work group briefly discussed sediment Toxicity Identification Evaluation (TIE) procedures. These procedures are not as well developed as for water, and it is not currently possible to establish a trigger level of toxicity for TIE implementation on a given sample. However, this field is currently the subject of active research, and the work group may revisit the issue in 6-12 months as this research progresses.